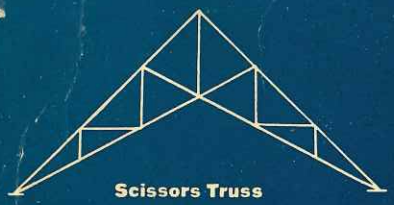
Parabolic Two-hinged Arch

Three-hinged Frame

Bowstring Truss

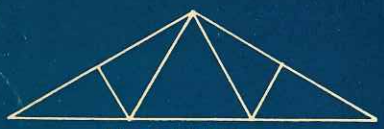


Scissors Truss

Belgian Truss

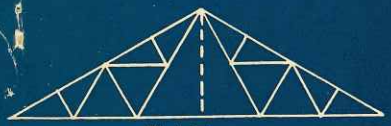
Sawtooth Truss

Lattice Truss

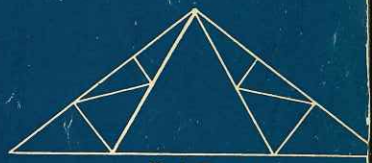


Simple Fink Truss

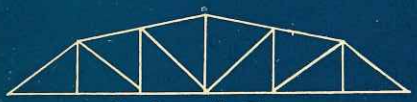
Triangular Pratt Truss



Fink Truss

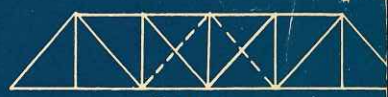


Fink Truss

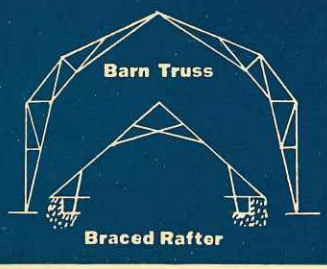


Quadrangular Truss

Double Warren Truss

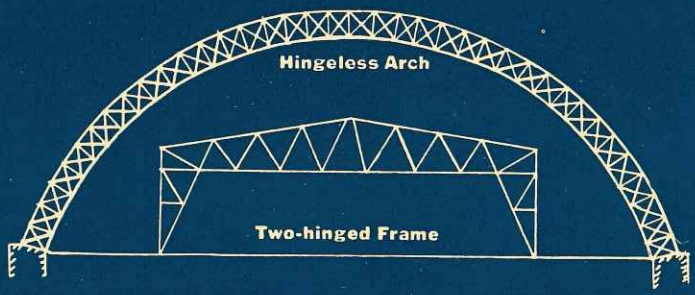


Pratt Truss



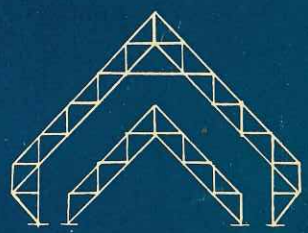
Barn Truss

Braced Rafter



Hingeless Arch

Two-hinged Frame

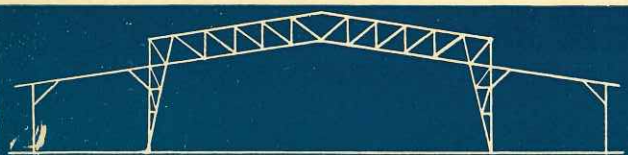


Three-hinged Frames

Modern TIMBER Roof TRUSSES

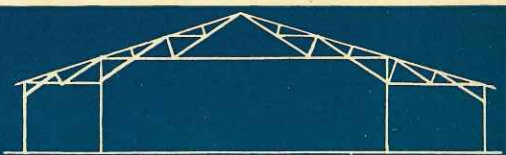
... *Built With* TECO TIMBER CONNECTORS

TIMBER ENGINEERING CO. TECO **WASHINGTON, D. C.**



Factory Roof

Platform Roof



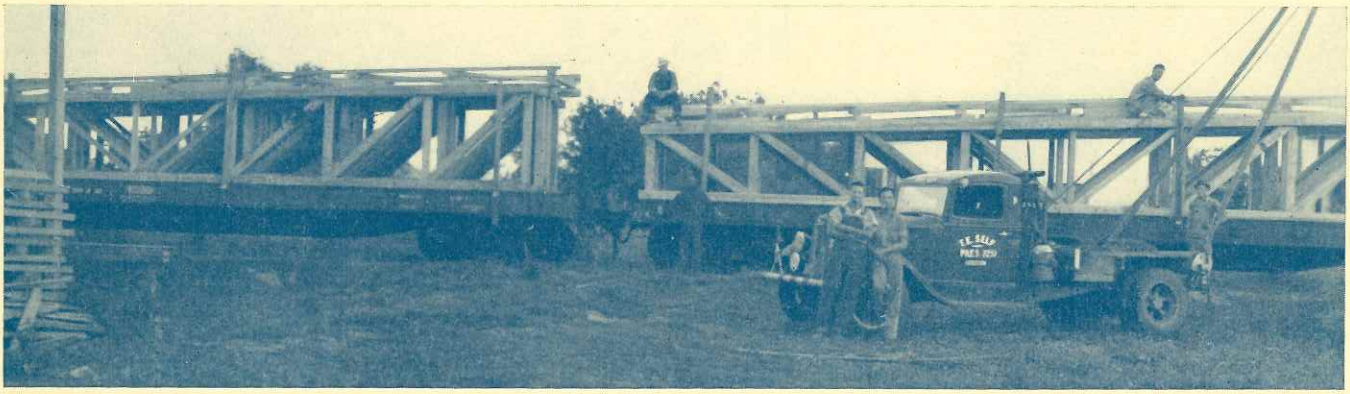
Shed Roof

TIMBER ROOF TRUSSES

Designed with TECO *Joint Connectors*

PRIOR to the introduction of timber connectors into the United States, the timber designer was somewhat limited in his use of timber as a structural material. The bulk of material required for a timber structure was governed by the amount or surface of timber necessary to produce a sound joint. Overdesigning and expensive fittings to secure an efficient joint was the result.

With the advent of Teco timber connectors in 1933 this wasteful practice was remedied. Timber connectors now make it possible to utilize 80% to 100% of the working stress capacity of the members instead of 40% to 60%, as formerly.



Packing house trusses. Two carloads of ready-to-erect timber trusses for Missouri Pacific Railroad's citrus warehouse, Engleman Gardens, Texas.

TECO connectors accomplish their purpose through decentralization of loads and stresses at joints. One or more bolts in ordinary timber framing cause all stresses to centralize on the small area against which bolts bear. Teco connectors enlarge the bearing area of such stresses to practically the entire width of the timbers involved.

Since Teco timber connectors and design data have been made available to the engineer, timber designing, and especially timber roof truss designing, has been greatly simplified. This has resulted in an improved structure and a new economical form of construction.

Much of the popularity in favor of the Teco system is due to the fact that local firms can readily supply the material and local carpenter and common labor can do the fabrication and erection. This factor results in keeping money at home in the builders' community. Modern timber-connector trusses, because of their simplicity, require no unusual skill. The methods of fabrication and erection follow the every-day practices of any good carpenter-contractor.

The Timber Engineering Company manufactures and sells patented Teco timber connectors for the purpose of saving money for builders and making available to a wider range of light and heavy frame buildings the fundamental economy of timber construction.

Examination of plans for the adequate and proper use of Teco timber connectors is one of the services rendered by the Timber Engineering Company. Only detailed drawings should be submitted for examination.

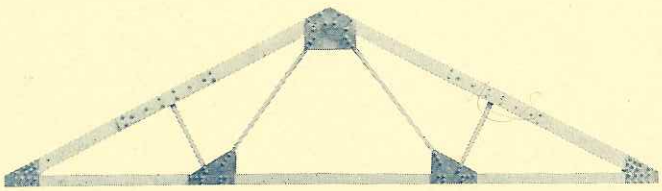
This bulletin has been prepared for the purpose of outlining to the building profession the value of Teco timber-connector construction. A few types of modern and economical timber roof trusses employing Teco connectors are illustrated in the following pages.

BUILD WITH TIMBER—*America's Only Renewable Natural Resource*

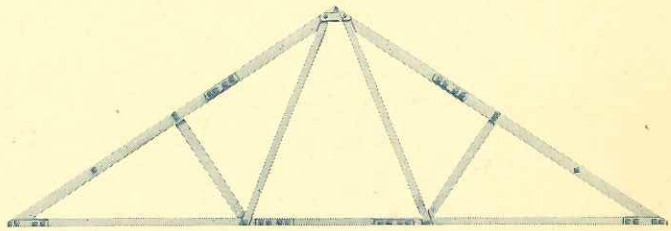
TIMBER-CONNECTOR TRUSSES ARE ECONOMICAL

FOR comparative study of a modern and economical timber connector roof truss consider the two trusses illustrated below. Prior to the introduction of Teco joint connectors, a typical design for a 40 foot span timber Fink roof truss with 45# total loading and 16 foot spacing called for 696 board feet of solid timber members using 538 pounds of steel plates and angles and 102 bolts for connections at a total materials cost of $80.93 based on Washington D. C. prices.

Today a timber-connector built truss (TECO Typical Design #223) with spaced members for the same conditions eliminates all of the steel gusset plates and angles at a saving of over one-third or $26.90, reduces the number of bolts from 102 to 38, reduces the amount of timber required by 150 board feet and uses only 120 TECO toothed ring connectors—at a total materials cost of only $43.71, or a saving of $37.22 per truss. A similar type of truss in steel to meet these same design conditions would have a materials cost of around $54.38, or $10.67 more than the cost of materials in the TECO connector timber truss.



Old style bolted design with solid members and steel gusset plates.

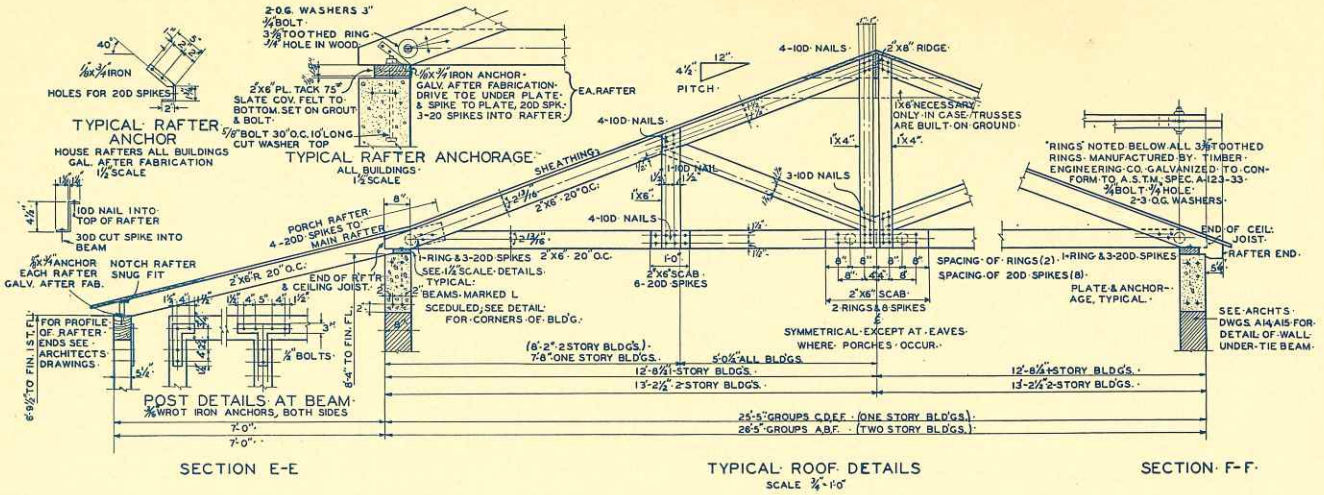


New style design with spaced members and Teco connector.

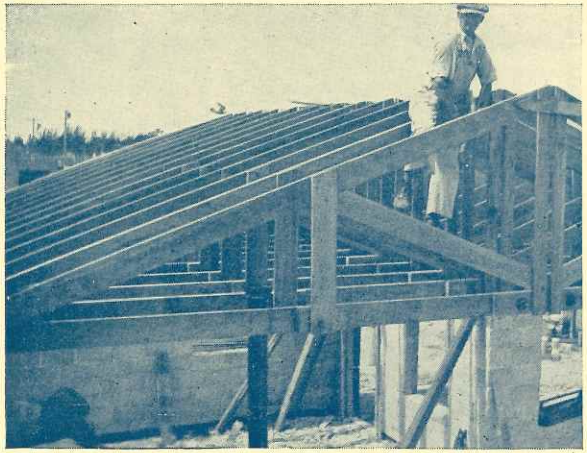
Detailed Comparison of Old and New 40' Fink Truss

Designed for a 45-lb. Loading and a 16-ft. Spacing. Built of No. 1 Structural Material

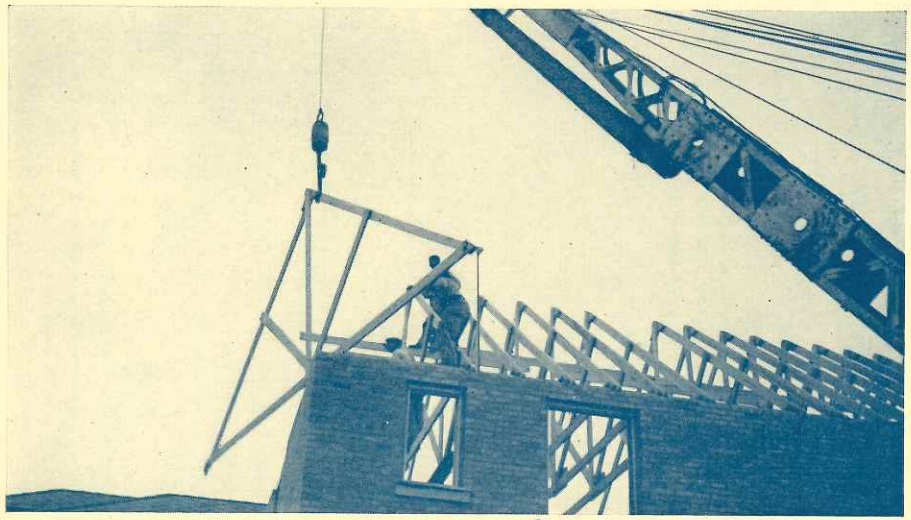
Old Design — Bolted Design with Solid Members		New TECO Design — Connector Design with Spaced Members
Old Design 1–4″x6″x10′ 1–4″x6″x12′ 2–3″x12″x14′ 4–6″x10″x14′ 4–6″x12″x12′ Total 696 FBM @ $40/M = $27.84	**LUMBER** Vertical Diagonal Splices Bottom chord Top chord	**New TECO Design #223** 1–3″x8″x18′ 4–2″x6″x16′ 2–2″x6″x12′ 1–2″x6″x16′ 1–3″x10″x6′ 1–3″x6″x14′ 5–3″x6″x16′ 4–3″x10″x16′ 2–3″x10″x18′ Total 546 FBM @ $40/M = $21.84
Old Design 538 # Gusset Plates and Angles @ 5c/# Cost $26.90	**STEEL**	**New TECO Design** None
Old Design Machine Bolts 72–1″x9″ $13.73 “ “ 24–1″x12″ 5.44 “ “ 4–3/4″x14″ .58 “ “ 2–3/4″x6″ .16 O. G. Washers 48 for 1″ bolts 5.28 Total $25.19 **Old Design** **Total Cost of Materials = $80.93 (100%)**	**HARDWARE**	**New TECO Design** TECO Toothed Rings 16–2–5/8″ $1.44 “ “ “ 104–4″ 10.93 Machine Bolts 10–3/4″x10″ 1.13 “ “ 26–3/4″x13″ 3.53 “ “ 2–3/4″x15″ .28 Plate Washers 76 for 3/4″ bolts 4.56 Total $21.87 **New TECO Design** **Total Cost of Materials = $43.71 (54.0%)**

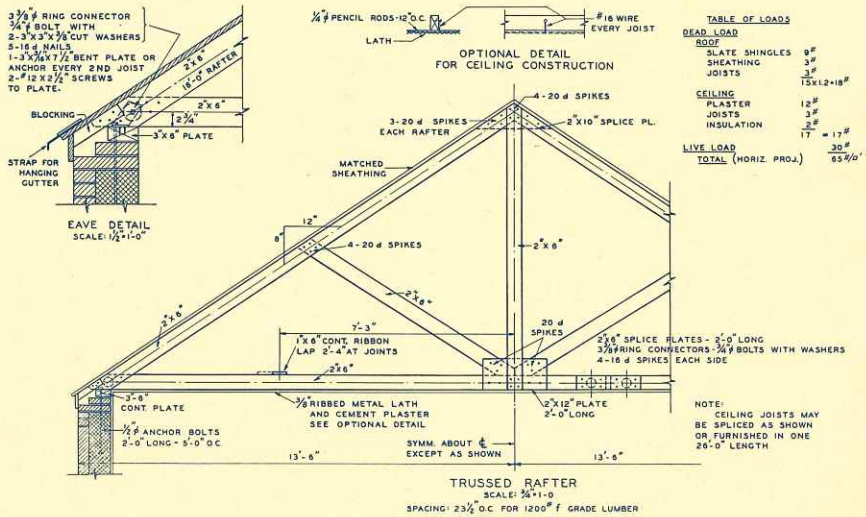

TYPICAL RAFTER ANCHOR
HOUSE RAFTERS ALL BUILDINGS GAL. AFTER FABRICATION
TYPICAL RAFTER ANCHORAGE
ALL BUILDINGS
SECTION E-E
TYPICAL ROOF DETAILS
SCALE ¾"-1'-0"
SECTION F-F
POST DETAILS AT BEAM
SHEATHING
PORCH RAFTER
MAIN RAFTER
PITCH
RIDGE
PLATE & ANCHORAGE, TYPICAL
SYMMETRICAL EXCEPT AT EAVES WHERE PORCHES OCCUR
SEE ARCHTS DWGS. A14 A15 FOR DETAIL OF WALL UNDER TIE BEAM
RINGS NOTED BELOW ALL 3⅜" TOOTHED RINGS MANUFACTURED BY TIMBER ENGINEERING CO. GALVANIZED TO CONFORM TO A.S.T.M. SPEC. A-123-33
END OF CEIL. JOIST
RAFTER END
SCHEDULED, SEE DETAIL FOR CORNERS OF BLD'G.
BEAMS MARKED L
TYPICAL
SEE ARCHITECTS DRAWINGS
FOR PROFILE OF RAFTER ENDS SEE
END OF RAFTER & CEILING JOIST
SPACING OF RINGS (2) 1-RING & 3-20D SPIKES
SPACING OF 20D SPIKES (8)
2 RINGS & 8 SPIKES
2"X6" SCAB
6-20D SPIKES
1-RING & 3-20D SPIKES 2'X6' 20" O.C.
SEE 1½" SCALE DETAILS
(6'-2" 2 STORY BLD'GS.)
7'-8" ONE STORY BLD'GS.
5'-0½" ALL BLD'GS
12'-6½" 1-STORY BLD'GS.
13'-2½" 2-STORY BLD'GS.
12'-8¼" 1-STORY BLD'GS.
13'-2¼" 2-STORY BLD'GS.
25'-5" GROUPS C.D.E.F. (ONE STORY BLD'GS.)
26'-5" GROUPS A.B.F. (TWO STORY BLD'GS.)
7'-0"
7'-0"

A close-up of truss erection on the Sixty-second Street housing job of the Works Progress Administration at Miami, Florida.



Timber-connector trussed rafters being hoisted into place on Magnolia Street Housing Project, New Orleans, La., November, 1939. Trusses are erected at the rate of about one every 45 seconds.





FEDERAL HOUSING PROJECT TRUSSES

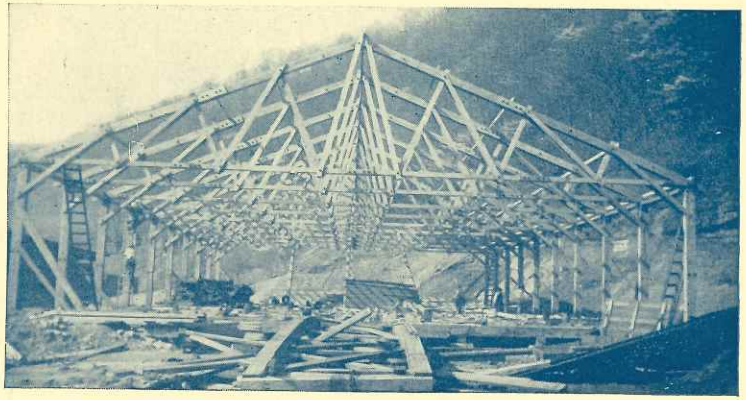
These types of trusses have been used on a large number of PWA housing and U. S. Housing Authority projects. Typical of these is the 62nd St. project, Miami, Florida, which used 3,000 southern pine timber trusses of 26′ span with TECO toothed rings in the lower chord. Upper and lower chords 2″ x 6″ were cut to specification at the mill.

Braces and splice plates were cut at job site by machine and hand. Assembly crew of two carpenters and two laborers turned out 25 trusses per 8-hour day. The use of lumber provides a maximum of employment for local labor and ordinarily the use of local materials.

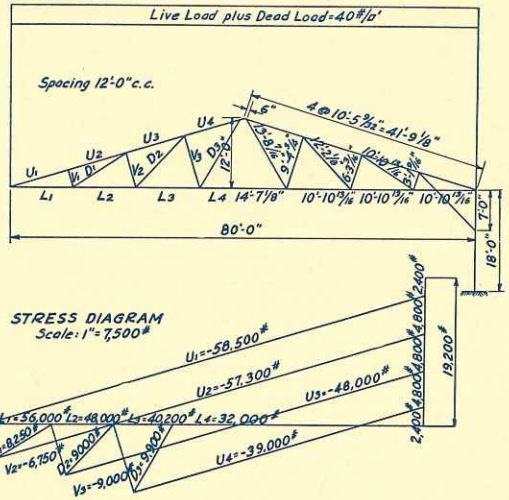
Other PWA projects include Jacksonville, Fla., project; Old Harbor Village, South Boston, Mass.; Fairfield Courts, Stamford, Conn.; LaSalle Place, Louisville, Ky.; College Court, Birmingham, Ala.; Bluegrass and Aspendale Park, Lexington, Ky.; and Cheatham Place, Nashville, Tenn.

Fifty-one U. S. Housing Authority projects that have used or are now specifying timber-connector roof truss construction are located in 34 cities, some of which are: Youngstown, Ohio; New Orleans, La. (7); Augusta, Ga. (2); Charleston, S. C. (3); Cleveland, Ohio; Birmingham, Ala. (2); San Francisco, Calif.; Miami, Fla. (2); Savannah, Ga. (2); Chattanooga, Tenn. (2); Washington, D. C.; Honolulu, T. H.; Laurel, Miss. (2); Covington, Ky.; Bristol, Va. (2).

Clear Span Timber Trusses for All Types of Industrial Building

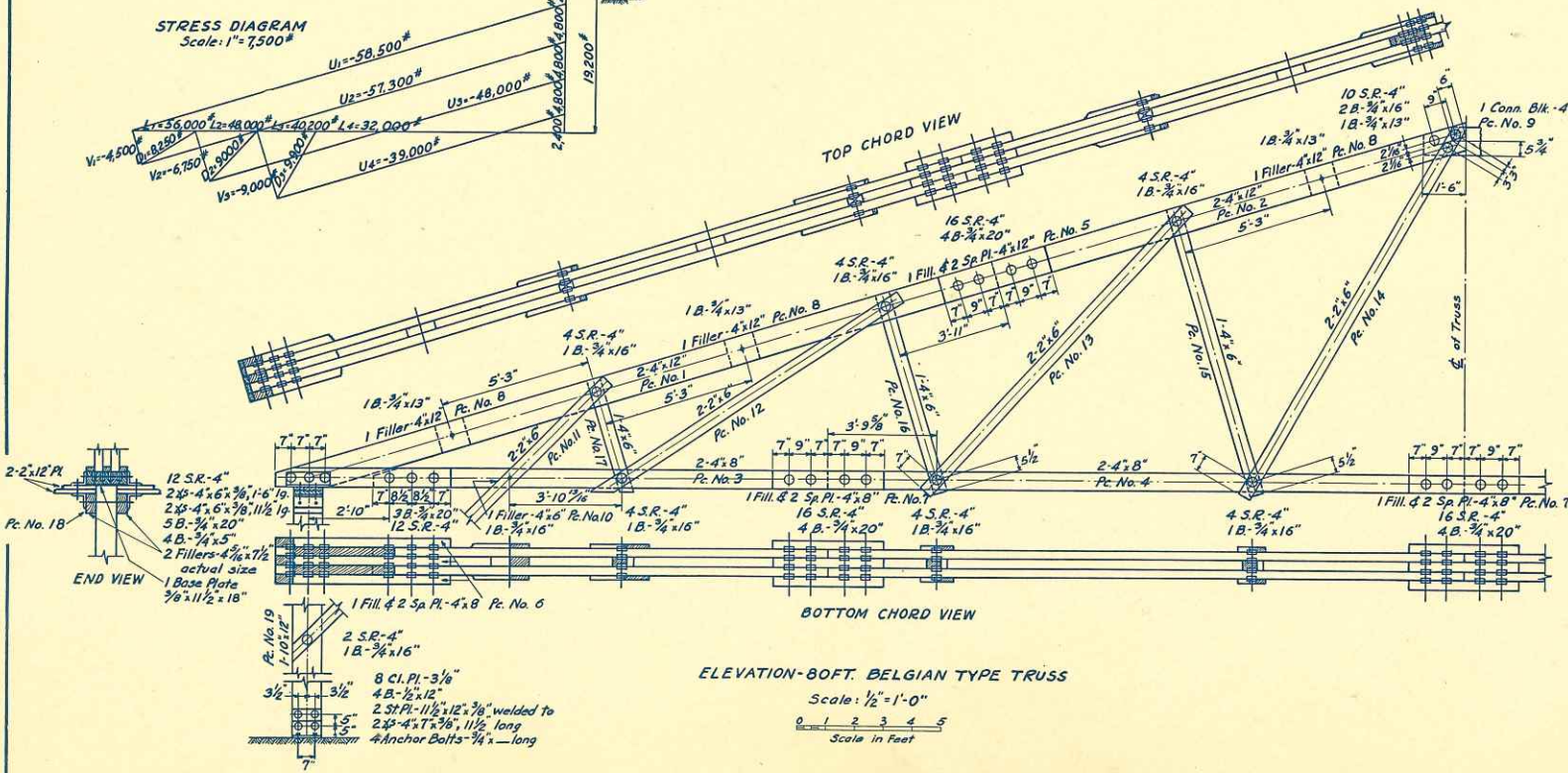


Planing Mill, Leatherwood Plant, W. M. Ritter Lumber Co., Walter, Ky. Building is 70' x 140' and uses Belgian type Teco trusses of white oak. Clear spans make 100% of floor space possible.



MATERIALS LIST PER TRUSS						
LUMBER CUTTING BILL (S4S)						
Mk.	Size	Length	Make	Cut From	Order	F.B.M.
1	4"x12"	26'-0"	4	26'-0"	4	416
2	4"x12"	17'-1"	4	18'-0"	4	288
3	4"x8"	15'-9"	4	16'-0"	4	171
4	4"x8"	22'-0"	4	22'-0"	4	235
5	4"x12"	3'-10"	6	12'-0"	2	96
6	4"x8"	6'-0"	6	18'-0"	2	96
7	4"x8"	3'-10"	9	22'-8"	1	96
8	4"x12"	1'-0"	6	10'-0"	1	40
9	4"x12"	3'-0"	1	Pc. No. 8		
10	4"x6"	1'-5"	2	12'-0"	1	24
11	2"x6"	15'-8"	4	16'-0"	4	64
12	2"x6"	12'-8"	4	14'-0"	4	56
13	2"x6"	13'-5"	4	14'-0"	4	56
14	2"x6"	15'-1"	4	16'-0"	4	64
15	4"x6"	10'-4"	2	18'-0"	2	72
16	4"x6"	7'-3"	2	Pc. No. 15		
17	4"x6"	4'-3"	2	Pc. No. 10		
18	6"x8"	0'-11½"	4	4'-0"	1	16
19	10"x12"	18'-0"	2	18'-0"	2	360
					Total F.B.M.	2150

HARDWARE		
No.	Item	Size
200	Split Rings	4" ø
16	Claw Plates	3⅛ ø
8	Machine Bolts	½"x12"
8	" "	¾"x5"
8	" "	¾"x13"
20	" "	¾"x16"
36	" "	¾"x20"
16	Cut Washers	2" ø
108	Plate Washers	3"x3"x⅜"
4	Angles	4"x6"x⅜, 11½ lg.
4	"	4"x6"x⅜, 1'-6 lg.
4	" welded to	4"x7"x⅜", 11½ lg.
4	Steel Plates	11½"x12"x⅜"
8	Anchor Bolts	¾"x —— lg.
2	Base Plates	11½"x18"x⅜"



NOTES:

GENERAL

This design shall be used with 3"x12" purlins placed directly over panel points and 2" roofing placed on purlins.

CAMBER

The proper camber may be introduced into this truss by raising the lower chord 3" at the center during fabrication.

LUMBER

Lumber shall be of a dense structural grade with minimum allowable working stresses in lbs. per sq. in. as follows:

880# Compression parallel to grain.
1200# Extreme fiber in bending
1,600,000# Modulus of elasticity

Allowable unit working stresses for commercial grades of lumber are given in the National Lumber Manufacturers Association's leaflet, "Working Stresses for Structural Lumber and Timber," or are given in the Grading Rules available from the Regional Lumber Manufacturers Associations.

TIMBER CONNECTORS

Connectors shall be TECO split rings and claw plates as manufactured by the Timber Engineering Company, Washington, D. C.

Typical design for use of Engineers and Architects

The Story in Pictures o

for **TREXLER LUM**

ALLENTO

FIGUR

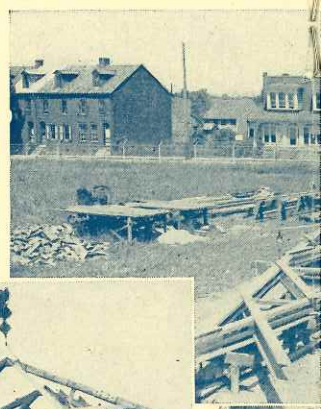


FIGURE No. 3

TO W
snow
Comp
ber
struc
ber
the n
throu
so strengthen the joints t
from the old shed could be
more than double the roof.

FIGURES 1, 2 and 3—The
and cut to shape, using tem
lar saw driven by an old a
members were assembled o
the foreground, on which a
drawn, using nails to hold
bolt holes were drilled, the
by piece, and grooved for

The truss was again as
nectors in the grooves, an
The completed trusses were
jacent to the site of the sh

The trusses were swung
mounted on a truck. The
side trusses were placed firs
shed. Later the other side

A center truss being swung into position

NOTES

LUMBER SPECIFICATIONS
LUMBER SHALL BE OF A GRADE WHICH PROVIDES THE FOLLOWING SAFE UNIT WORKING STRESSES:
1200# (FIBER STRESS)
80#/sq.in. (COMPRESSION PARALLEL WITH GRAIN)
1,600,000#/sq.in. (MODULUS OF ELASTICITY)
SPECIFIC GRADES AND ALLOWABLE UNIT WORKING STRESSES ARE GIVEN IN THE ATTACHED NATIONAL LUMBER MANUFACTURERS ASSOCIATION LEAFLET "WORKING STRESSES FOR LUMBER AND TIMBER" OR ARE AVAILABLE FROM REGIONAL LUMBER MANUFACTURERS ASSOCIATIONS.

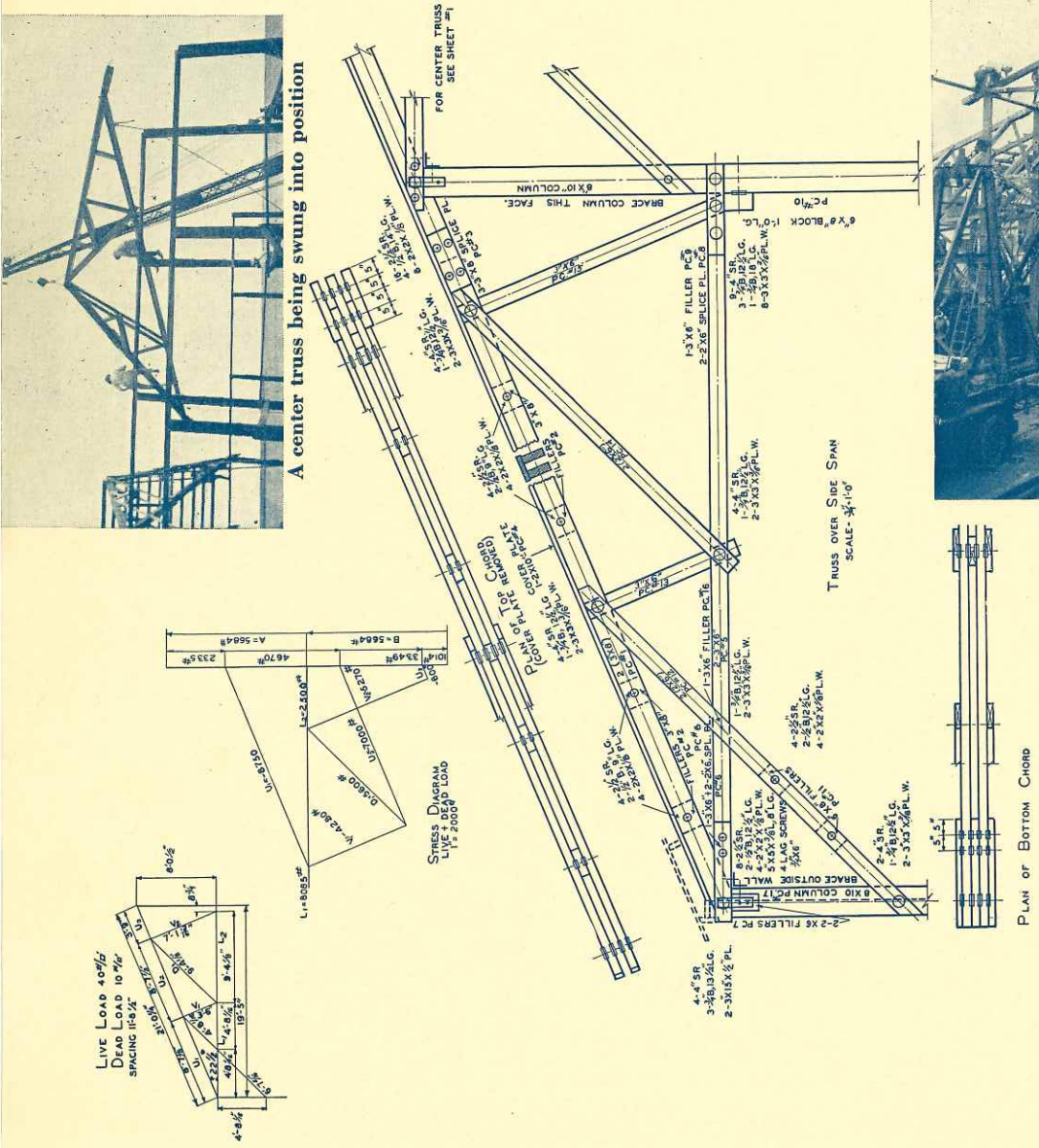
QUANTITIES PER TRUSS

LUMBER		
2 PIECES	2"x6"x18'-0"	36 FT. B.M.
2 "	2"x6"x12'-0"	24 " "
2 "	3"x6"x20'-0"	60 " "
2 "	3"x8"x20'-0"	80 " "
1 "	3"x10"x8'-0"	16 " "
1 "	6"x8"x2'-6"	10 " "
1 "	2"x10"x20'-0"	34 " "
	TOTAL	284 FT. B.M.

HARDWARE NO.	ITEM	SIZE
36	TECO SPLIT RINGS	2½" ø
27 "	" "	4" ø
4	MACHINE BOLTS	½"x 9"
4 "	"	½"x 12½"
4 "	"	½"x 14"
8 "	"	½"x 12½"
3 "	"	¾"x 13½"
1 "	"	¾"x 18"
4	ANGLE LAG SCREWS	⅜"x 4"-¾"x 6" Lg.
2	STEEL PLATES	¾"x 15½"
24	PLATE WASHERS	2"x2"x⅛" PUNCHED ⅝" ø
16	" "	3"x3"x¼" " 1⅛" ø

SPLIT RING CONNECTORS
CONNECTORS SHALL BE TECO SPLIT RINGS AS MANUFACTURED BY THE TIMBER ENGINEERING COMPANY

TYPICAL DESIGN FOR INFORMATION OF ARCHITECTS AND ENGINEERS



of a Giant Timber Shed

MBER COMPANY

OWN, PA.

No. 1

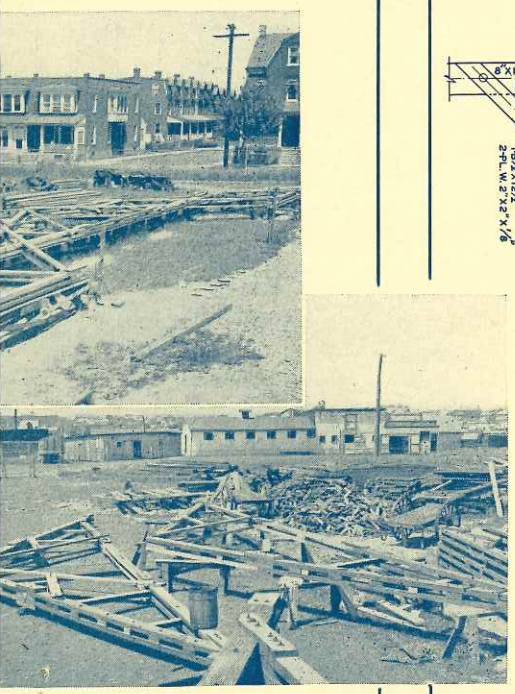


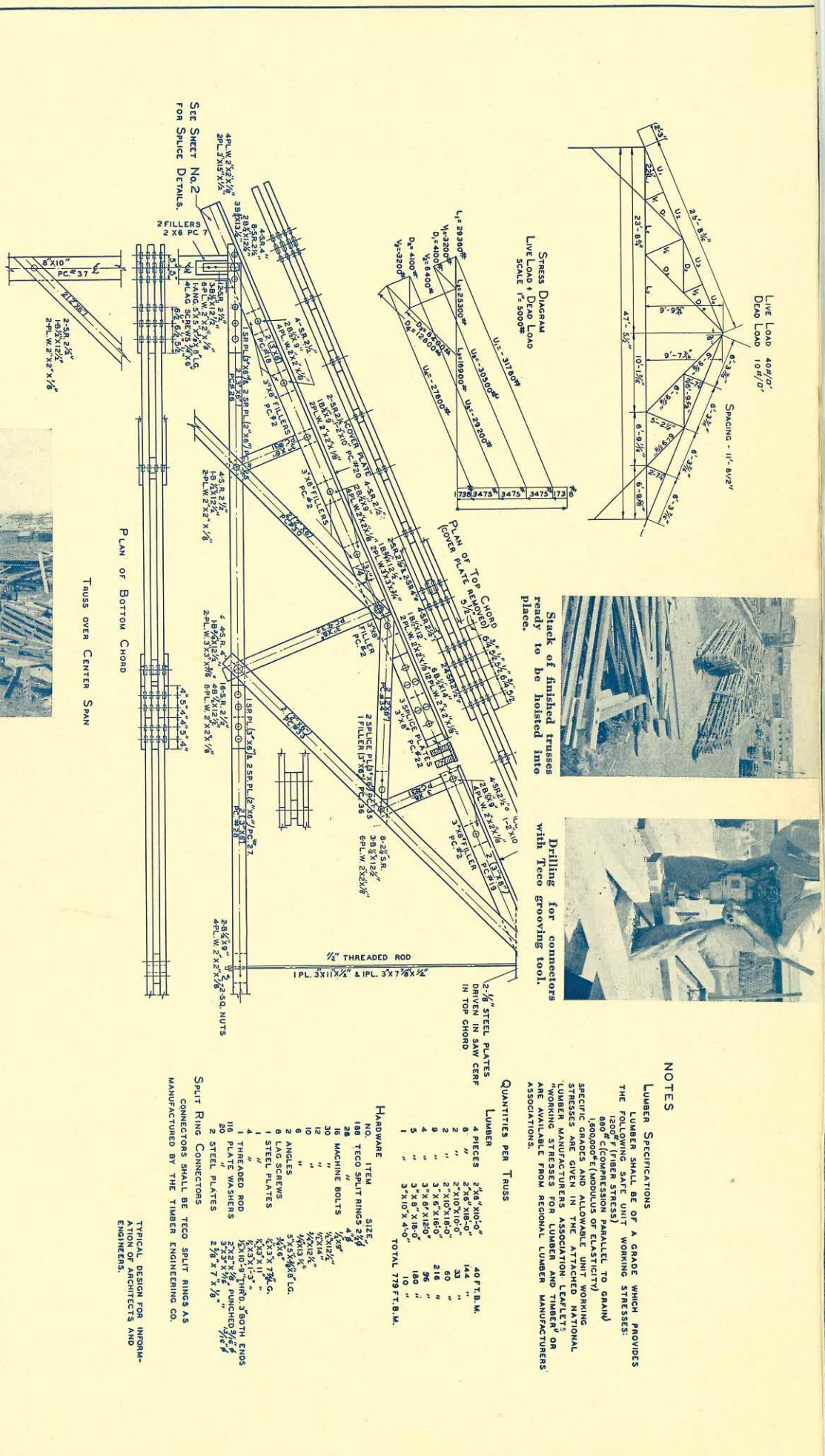
FIGURE NO. 2

VITHSTAND heavy ice and loads the Trexler Lumber pany chose the TECO timconnector system of contion for its 87′ x 500′ lumstorage shed. In building ew trusses it was possible, gh the use of connectors, to hat much salvaged lumber used and at the same time load capacity.

truss members were marked plates, by means of a circutomobile motor. Next, the n a level platform shown in n outline of the chords was the members in place. The e trusses taken apart piece split rings.

sembled after placing con- d the bolts were tightened. e stacked on the ground ad- ed.

in place, using a steel boom center truss and one of the st in the whole length of the trusses were placed.


LIVE LOAD 40#/0'
DEAD LOAD 10#/0'
SPACING - 11'-8½"
STRESS DIAGRAM
LIVE LOAD + DEAD LOAD
SCALE 1"= 5000#
SEE SHEET No. 2 FOR SPLICE DETAILS.
2 FILLERS 2 X6 PC 7
8"X10" PC. #37
PLAN OF BOTTOM CHORD
TRUSS OVER CENTER SPAN
PLAN OF TOP CHORD (COVER PLATE REMOVED)
½" THREADED ROD
1 PL. 3"X11½" & 1 PL. 3"X7⅞"X½"
2½" STEEL PLATES DRIVEN IN SAW CERF IN TOP CHORD

Stack of finished trusses ready to be hoisted into place.

Drilling for connectors with Teco grooving tool.

NOTES

LUMBER SPECIFICATIONS

LUMBER SHALL BE OF A GRADE WHICH PROVIDES THE FOLLOWING SAFE UNIT WORKING STRESSES:

1200# F (FIBER STRESS)
880# C (COMPRESSION PARALLEL TO GRAIN)
1,800,000# E (MODULUS OF ELASTICITY)

SPECIFIC GRADES AND ALLOWABLE UNIT WORKING STRESSES ARE GIVEN IN THE ATTACHED NATIONAL LUMBER MANUFACTURERS ASSOCIATION LEAFLET "WORKING STRESSES FOR LUMBER AND TIMBER" OR ARE AVAILABLE FROM REGIONAL LUMBER MANUFACTURERS ASSOCIATIONS.

QUANTITIES PER TRUSS

LUMBER		
8	PIECES	2"x8"x10'-0"
4	"	2"x8"x18'-0"
2	"	2"x10"x10'-0"
2	"	2"x10"x16'-0"
9	"	3"x6"x16'-0"
4	"	3"x8"x12'0"
5	"	3"x8"x18'-0"
1	"	3"x10"x 4'-0"
		TOTAL 779 FT.B.M.

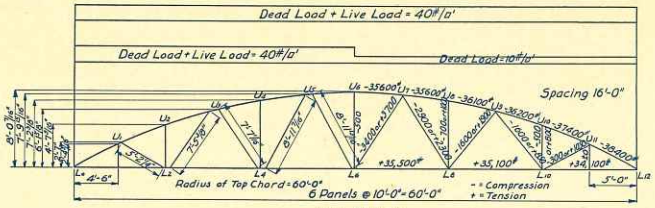
40 FT.B.M.
144 " "
33 " "
60 " "
216 " "
96 " "
180 " "
10 " "

HARDWARE		
NO.	ITEM	SIZE
188	TECO SPLIT RINGS	2½" ⌀
28	"	4" ⌀
16	MACHINE BOLTS	⅝"x8"
30	" "	¾"x12"
12	" "	½"x12½"
10	" "	½"x12½"
6	" "	¾"x13½"
2	ANGLES	5"x5"x⅜"x6" LG.
6	LAG SCREWS	½"x6"
1	STEEL PLATES	⅝"x3"x 17'-6" LG.
	"	⅝"x3"x 11'-3" "
4	"	½"x10'-9" THRU 3" BOTH ENDS
1	THREADED ROD	2"x2"x ⅛" PUNCHED ⅝" ⌀
116	PLATE WASHERS	3"x3"x ⅛" " ⅝" ⌀
20	"	2⅛"x 7"x ⅛" " ⅛" ⌀
2	STEEL PLATES	

SPLIT RING CONNECTORS

CONNECTORS SHALL BE TECO SPLIT RINGS AS MANUFACTURED BY THE TIMBER ENGINEERING CO.

TYPICAL DESIGN FOR INFORMATION OF ARCHITECTS AND ENGINEERS.


Dead Load + Live Load = 40#/l.f.
Dead Load + Live Load = 40#/l.f.
Dead Load = 10#/l.f.
Spacing 16'-0"
Radius of Top Chord = 60'-0"
6 Panels @ 10'-0" = 60'-0"
- = Compression
+ = Tension

Line Diagram
Showing Dimensions and Design Stresses.

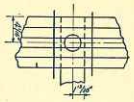
NOTE:
Top chord members are built up to the desired curvature with 2"x4" lumber, glued together with casein glue, and nailed with 20d nails, spaced 12" c.c., and in a staggered position, about 1" from each edge. This nailing will assist in holding members in position while glue is setting up. Laminations are further reinforced at panel points by a through bolt ½" in diameter.

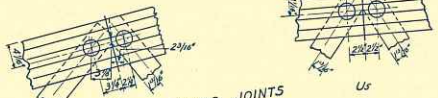
When top chord is laid out, cut web members to fit truss, and bore all bolt holes. Truss is then taken apart and grooves cut for the split rings and shear plates, truss is then reassembled.

CAMBER
Camber of 1½" in bottom chord should be provided for when fabricating truss.

NOTES:
LUMBER SPECIFICATIONS
Lumber shall be of a structural grade with minimum allowable working stresses in pounds per sq. in. as follows:
880# Compression parallel to grain.
1200# Extreme fiber in bending.
1,600,000# Modulus of elasticity.
Allowable unit working stresses for commercial grades are given in the attached N.L.M.A. leaflet "Working Stresses for Structural Lumber and Timber" or are available from the Regional Lumber Manufacturers Associations.

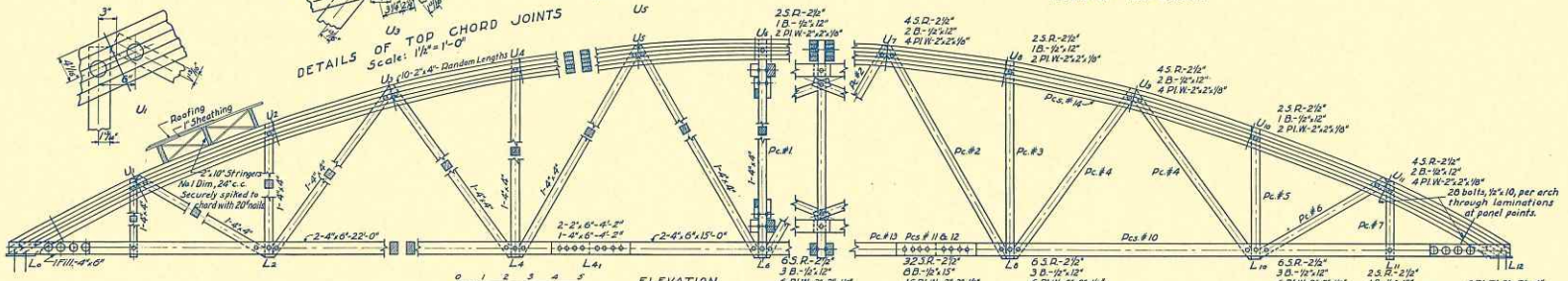
SPLIT RING CONNECTORS
Connectors shall be TECO split rings as manufactured by the Timber Engineering Company, Washington, D.C.



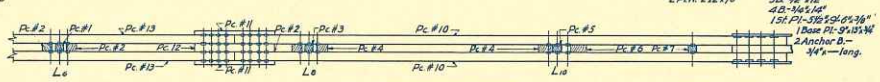


DETAILS OF TOP CHORD JOINTS
Scale: 1½" = 1'-0"

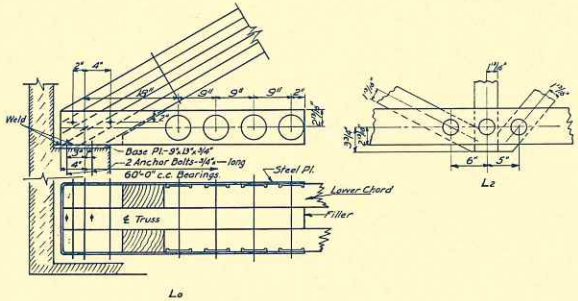
PLAN OF TOP CHORD

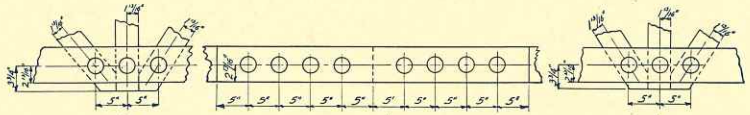


ELEVATION
Scale: ½" = 1'-0"



PLAN OF BOTTOM CHORD





DETAILS OF BOTTOM CHORD JOINTS
Scale: 1½" = 1'-0"

40	Machine Bolts	½"x12"
16	" "	½"x15"
28	" "	½"x10"
8	" "	¾"x14"
136	Plate Washers	2"x2"x⅛"
2	Steel Plates	5½"x9-6"x⅜"
4	Anchor Bolts	¾"ø—lg.
2	Base Plates	9"x13"x¾"

Longitudinal bracing and hardware for same is not incl. in Matl's. List.

Typical design for use of Engineers and Architects.

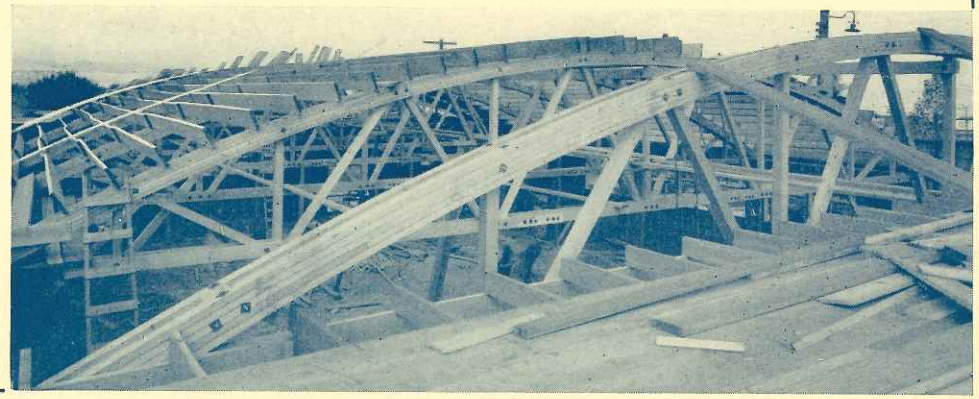
MATERIALS LIST (For one truss)
Lumber (S4S)

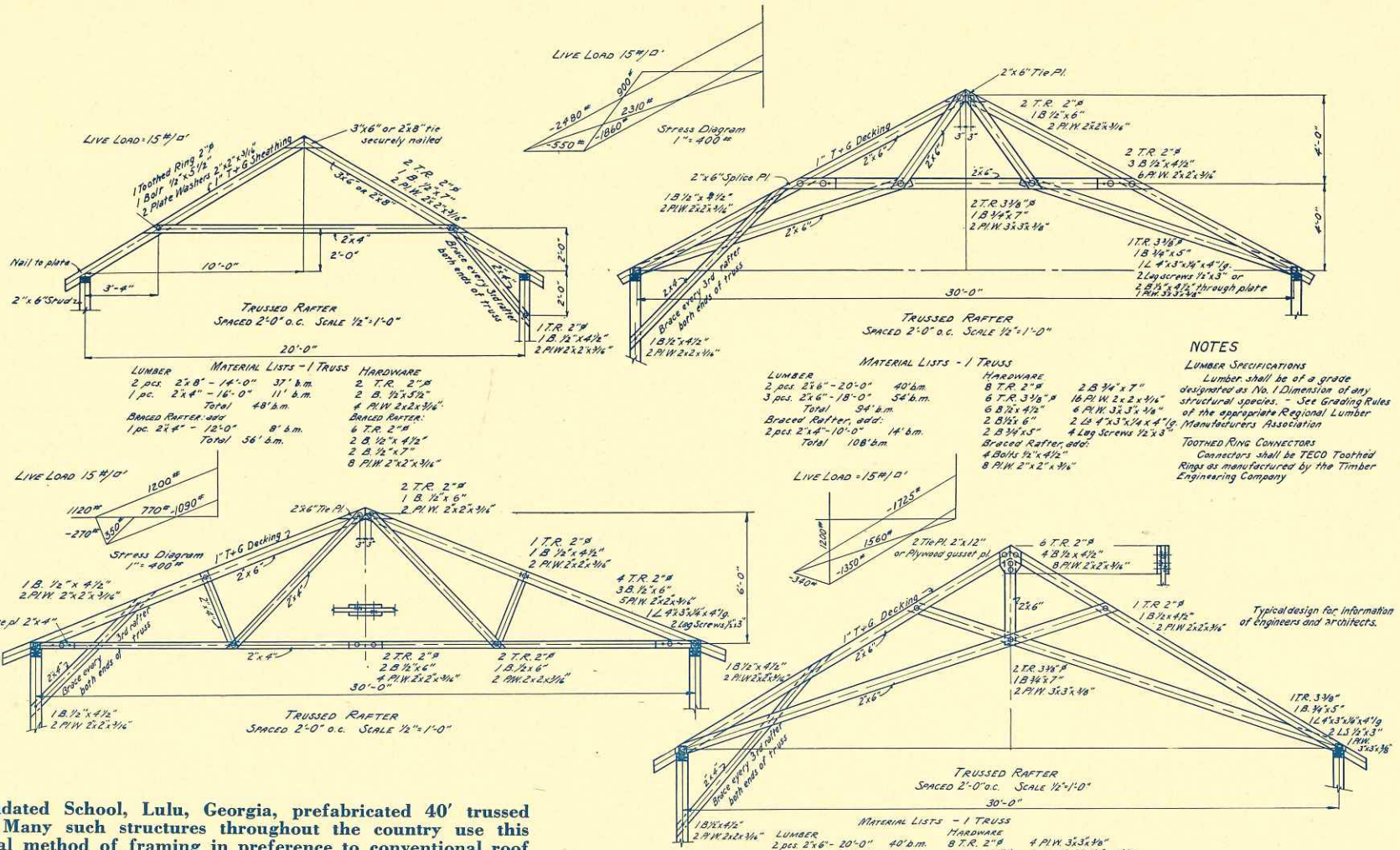
630'	2"x4" Random	420	Ft. B.M.
1 Piece	2"x6"x18'-0"	18	"
5 "	4"x4"x10'-0"	66	"
1 "	4"x4"x12'-0"	16	"
1 "	4"x4"x16'-0"	21	"
3 "	4"x4"x18'-0"	72	"
1 Piece	4"x6"x18'-0"	36	Ft. B.M.
2 "	4"x6"x16'-0"	64	"
4 "	4"x6"x22'-0"	176	"
	Total	889	Ft. B.M.

Hardware
16 Pl.F.I. Shear Plates-4"ø
132 Split Rings 2½"ø

Teco Timber Trusses Are Economical

Teco Bowstring trusses of 60′ span were decided upon for this Super Market Building, Helena, Montana. Original plans specified steel roof construction. Timber trusses were substituted because of economy. Actual saving of nearly 50 per cent, or in round figures, $900 for six trusses was the result. This was the contractor's first experience with Teco construction.





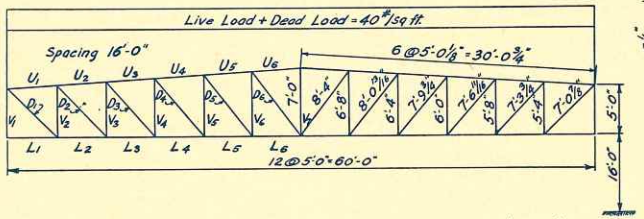
Consolidated School, Lulu, Georgia, prefabricated 40' trussed rafters. Many such structures throughout the country use this economical method of framing in preference to conventional roof rafter construction.

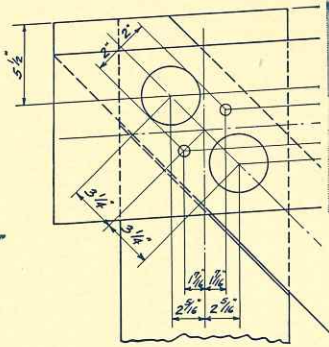
Teco Trussed Rafters Serve Wide Field

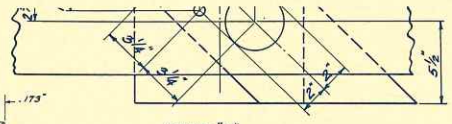
Trussed rafters for roof construction offer a means of using small sizes of lumber and because of their light weight seldom require special equipment for placing into position. As their name implies, they function both as rafter and truss. Their simple joints facilitate fabrication. In many cases the trussed rafter provides the most economical means of filling the gap between the roof that is too large for simple rafter construction and too small to justify the heavier type of truss construction. These types of wood trusses are especially suited for small warehouses, garages, shops, boat houses and implement sheds.

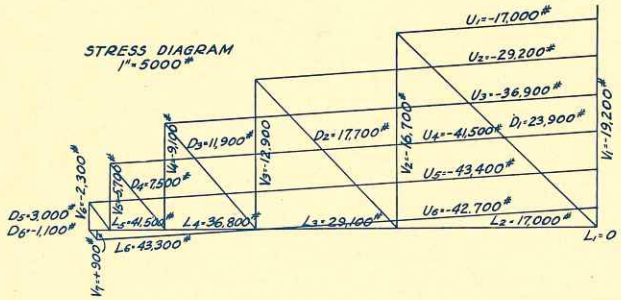
Strong Clear Span Trusses

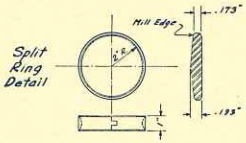
Red River Lumber Company, Westwood, California. This loading shed is 100′ x 250′ with a total of 25,000 square feet of working area. Trusses of the Pratt type are spaced 14′ on centers and bear on timber columns 10″ x 14″. Trusses are designed for 65 pounds total load.











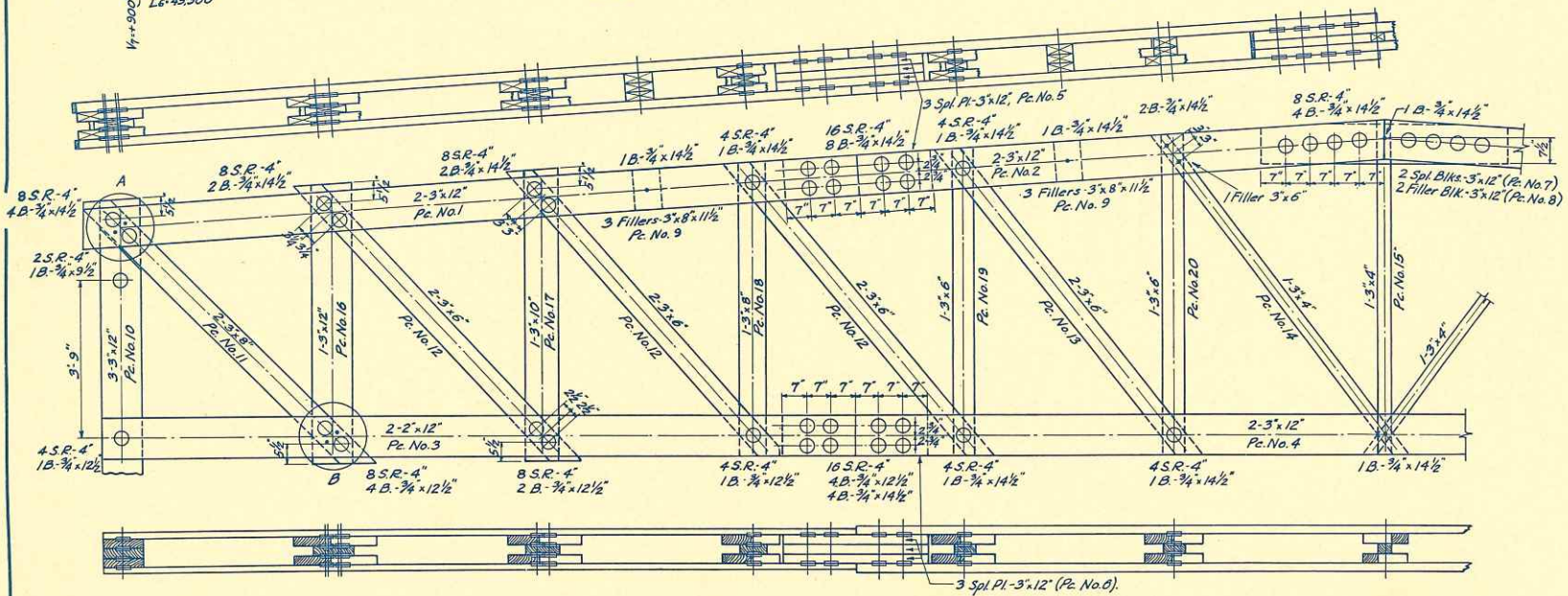
Allowable unit working stresses for commercial grades of lumber are given in the National Lumber Manufacturers Association's leaflet, "Working Stresses for Structural Lumber and Timber," or are given in the Grading Rules available from the Regional Lumber Manufacturers Associations.

TIMBER CONNECTORS

Connectors shall be TECO split rings as manufactured by the Timber Engineering Company, Washington, D.C.

MATERIALS LIST PER TRUSS						
LUMBER CUTTING BILL (S4S)						
Mk.	Size	Length	Make	Cut From	Order	F.B.M.
1	3"x12"	18'-5"	4	20'-0"	4	240
2	3"x12"	12'-6"	4	14'-0"	4	168
3	2"x12"	17'-10"	4	18'-0"	4	144
4	3"x12"	25'-0"	2	26'-0"	2	156
5	3"x12"	3'-6"	6	14'-0"	9	126
6	3"x12"	3'-6"	6			
7	3"x12"	5'-10"	2	18'-0"	1	54
8	3"x12"	2-9 1/2"	2			
9	3"x8"	0'-11 1/2"	12	Pc's No. 1 & 2		
10	3"x12"	21'-8"	6	22'-0"	6	396
11	3"x8"	9'-4"	4	20'-0"	2	80
12	3"x6"	9'-6"	12	20'-0"	6	180
13	3"x6"	9'-6"	4	20'-0"	2	60
14	3"x4"	9'-8"	2	10'-0"	2	20
15	3"x4"	8'-0"	1	8'-0"	1	8
16	3"x12"	6'-8"	2	14'-0"	1	42
17	3"x10"	7'-0"	2	14'-0"	1	35
18	3"x8"	7'-0"	2	14'-0"	1	28
19	3"x6"	7'-4"	2	16'-0"	1	24
20	3"x6"	7'-8"	2	16'-0"	1	24
				Total F.B.M.		1785

HARDWARE		
No.	Item	Size
212	Split Rings	4" ϕ
2	Machine Bolts	5/8" x 9 1/2"
24	" "	3/4" x 12 1/2"
66	" "	3/4" x 14 1/2"
184	Cut Washers	3" x 3" x 3/16"



60 FT. FLAT TOP PRATT TRUSS

Scale: 3/4" = 1'-0"

0 1 2 3

Scale in Feet

Typical design for use of Engineers and Architects

FIRE SAFETY OF TIMBER

PERHAPS the most prominent facts in the minds of laymen concerned with the relative fire safety of timber and other construction materials are that wood burns and some of the others do not. The actual performance of timber and other structural materials exposed to fire is seldom considered further. A review of facts, however, resulting from fires in timber structures and structures of other materials indicates that other factors than that of combustibility are equally, if not more, important.

Fire Hazards In Structures

In structures such as hangars, shops, garages, warehouses, etc., the fire hazard is not due to any appreciable extent to the structural material itself, but to the contents or to external conditions to which the building is exposed. It is the nature of the contents which determines the rate of fire spread, once a fire is started. Where the contents are highly inflammable, fires generally spread through an entire building within a few minutes and temperature builds up rapidly. Where metal trusses are used, buildings are frequently rendered unsafe almost immediately because of the possible collapse of the unprotected metal.

Contrast this with structures built of timber. An outstanding example of the fire safety value of a lumber-built airplane hangar equipped with sprinklers was demonstrated at the U. S. Bureau of Standards. Seventeen fire tests consumed 40 army airplanes and hundreds of gallons of gasoline and oil. After the final fire test, in which four planes were placed in the hangar with tanks filled with 360 gallons of gasoline and 40 gallons of oil, and 15 gallons of gasoline spilled on the floor and ignited, the hangar was still in excellent condition, there being only two lightly charred places on the wood-sheathed walls and roof.

In a six-story warehouse fire at Tacoma, Washington, the fire raged for nearly four hours and in spite of the fact that fire broke out on three floors by following up an elevator shaft, no failures occurred either in the wood laminated floors or in the heavy timber supporting columns and stringers. In almost the entire building the original timbers were subsequently covered over and permitted to remain in use.

Time to Failure

Based on standard fire temperatures of the American Society for Testing Materials tests of building materials, a temperature of 1100° F. is reached within six minutes. At this temperature certain structural metals have less than ½ of their normal tensile strength, and at 1700° F. they will not support the dead weight of a structure. Where there are highly combustible and volatile contents, such as oils, paints, lacquers, and certain processes, the fire may be a "flash" type and reach maximum temperatures of 2000-2500° F. in a few seconds, which will cause unprotected metal to collapse so quickly as to preclude the possibility of fighting the fire advantageously.

Wood will burn, but it loses its strength only in proportion to the degree of charring under fire temperatures. Penetration tests on wood exposed to standard fire temperatures show that in general wood chars and burns at the rate of about one inch in depth in 33 minutes. Based on the size of the members in the structures and a safety factor of 4 for the timbers, the actual failure time may be roughly computed for exposure to standard fire temperatures. For example, it is not unreasonable to expect that a tension member may have approximately three-fourths of its section charred before the stress in its remaining section is such that the timber might be expected to fail. Where timber joints are assembled with modern timber connectors, these may be expected to carry the load as long or longer than the chord members, due to the fact that the connectors are insulated from the heat and continue to carry most of their load even though the wood around the bolts may be charred by conducted heat. The higher the hazard or degree of combustibility of contents, the greater the relative fire safety of timber construction as compared to materials which may fail quickly under sudden and high temperatures.

Salvage Value

A fire in a building with unprotected metal trusses usually results in a twisted mass, requiring considerable expense in clearing it away. In contrast, damaged timber trusses are often repairable in place, or are readily dismantled with common labor, and unburned timbers are salvageable.

Trusses of other materials than timber, when falling, almost invariably pull over the side walls, while wood trusses generally cause no such damage when the walls are of brick or masonry construction.

Insurance Rates

While insurance rates may vary for different localities, heavy timber construction is generally recognized as having a much more favorable fire insurance rate than unprotected metal. Timber construction, sprinklered, is considered an exceptionally good fire risk and carries a proportionately low rate—in some instances it is the lowest obtainable.

Teco timber connector trusses are not limited to buildings of any particular periods. Shown above is the modern building of the Lou Lewis Food Market and Heights Post Office Substation Building, Houston, Texas. Building is 100′ x 93′ with Teco timber trusses.

Lumber and Connector Literature

TIMBER ENGINEERING COMPANY,

Engineering in Timber. A 24-page pictorial and descriptive presentation of Teco timber structures. Free.

The Manual of Timber Connector Construction. A 16-page bulletin giving technical data on Teco connectors. This Manual contains complete information for the use of engineers in designing wood structures. Data are based on test information obtained from U. S. Forest Products Laboratory. Free.

Typical Lumber Designs. A bulletin listing 100 typical designs for various types of light and heavy frame structures. Designs include quantities and materials lists. Free.

Railway Timber Structures. 8 pages. Details of typical railway uses for Teco timber connectors. Free.

Reprints from various trade magazines describing many types of interesting Teco connector-built structures. Free.

Instructions for use and care of Teco Grooving and Dapping Tools. Free.

Instructions for Installing Teco Toothed Ring Connectors with High Strength Rod and Ball Bearing Washer. Free.

NATIONAL LUMBER MANUFACTURERS ASSN.,

Wood structural Design Data is a 300-page book published by The National Lumber Manufacturers Association. It contains complete tables of safe loads for wood joists, beams and columns covering the full range of commercial sizes, species and grades, and of the spans and heights ordinarily used. The book contains in addition much information on the grading of structural timber properties of sections, board feet per linear foot and other data useful to designers. Price $1.00 per copy; with following supplements $1.25, U. S. postage paid.

Wood Structural Design Data Supplements:

Supplement 1—Working Stresses for Structural Lumber and Timber.
Supplement 2—Bolted Wood Joints—safe loads.
Supplement 3—Maximum Spans for Joists and Rafters.
Supplement 4—Wood Columns—safe loads.
Supplement 5—Wood Trusses—stress coefficients, length coefficients and angles.
Supplement 6—Manual of Timber Connector Construction.
Supplement 7—Stud Walls—safe axial loads.

Lumber Grade-Use Guide, published by National Lumber Manufacturers Association, presents in condensed form, convenient for specifying lumber uses, descriptions of the several grades of each commercial lumber species and shows the grades recommended to be used for each construction purpose. Consists of fifteen separate pamphlets aggregating over 200 pages, bound in 3-ring notebook. Price $1.50 per copy.

Stronger Frame Walls. How wood walls should be framed for greatest strength. Based on laboratory tests. (10¢)

Pictorial Review of Hangar Fire Tests. (10¢)

Exposing the Termite—Booklet giving brief history of the termite, how to detect their presence, and good construction methods of preventing termite attack. Free.

Teco Connectors Are Efficient Because They:

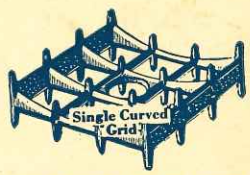
1. **Simplify designing in timber**
2. **Improve construction methods**
3. **Provide more efficient use of lumber**
4. **Require less hardware**
5. **Result in more economical structures**
6. **Result in more attractive structures**

Split rings of mild steel in sizes of 2½, 4, 6 and 8 in. diameters are for wood-to-wood connections for medium and heavy loads in permanent or demountable structures.

Toothed rings of 16-gage sheet steel in sizes of 2, 2⅝, 3⅜ and 4 in. diameters are for wood-to-wood connections in thin members or where loads are light.

Claw plates of malleable iron in 2⅝, 3⅛ and 4 in. diameters, male and female types, are for wood-to-wood connections or wood-to-steel in permanent or demountable structures.

Flanged shear plates of 2⅝ in. diameter pressed steel and 4 in. diameter malleable iron are for wood-to-wood, or wood-to-steel connections in permanent or demountable structures.



Spike grids of malleable cast iron, three types in sizes 4⅛x4⅛ in., are for bracing timber bents and trestles, and for piers, wharves, bulkheads and cribwork.

Distributors of Teco products and consulting engineers are located in principal cities.

TIMBER ENGINEERING COMPANY

1337 Connecticut Avenue **WASHINGTON, D. C.**

Subsidiary of the NATIONAL LUMBER MANUFACTURERS ASSOCIATION

Printed in U. S. A.
Revised 1-40. 15M
Revised 9-40. 15M
12-41. 15M

A. I. A. FILE NO. 19-B